

below that of former times, so that for such commodities as pepper the mere freight is almost a negligible item.

At the present day there can be no doubt that in point of quantity the spice trade is much larger than it ever was. If Venice could get the whole of that trade into her hands, a thing which she never had, notwithstanding the patriotic boast of Doge Mocenigo, the trade would not now bring her a tithe of the wealth which it brought in the days of her grandeur. Much has been said of the sudden "fall" of the Portuguese and Dutch in turn, and that fall has often been explained by mistakes in method. "The fall of the Dutch colonial empire resulted," says Sir William Hunter, "from its short-sighted commercial policy. It was deliberately based upon a monopoly of the trade in spices, and remained from first to last destitute of sound economical principles."<sup>1</sup> But one may well ask, Did the Dutch ever fail in a manner for which they were in any way responsible? It is true that the Dutch East India Company did not supply as many people as they could with the spices of which they held the monopoly. But that was not their aim. It is true that they did not build up a great empire like that of the English East India Company. But neither was that their aim. Their aim was to declare dividends, and dividends they declared. The profits of the company down to 1720 averaged 20 per cent. per annum, never sinking below 15 per cent., and sometimes rising to 50 per cent. If spices ceased to enable them to declare such dividends that was not their fault. It was James Watt, George Stephenson, William Symington, and Robert Fulton, who, without intending it, and without being able to foresee what in this respect they were destined to do, sucked the value out of pepper, and that in a manner which neither the strength of armies nor the subtlety of statesmen could have done anything to prevent.

Now the countries that offer the most attractive markets for the greatest quantities of goods of all kinds are no longer those which look to the spice trade or to trade in any specially valuable commodities for their enrichment, but those which abound in coal so placed as to develop a great amount of manufacturing industry, an industry engaged for the most part in working for the million, not merely in producing the luxuries of the rich. The commodities of very small bulk in proportion to their value now have a comparatively insignificant place in commerce. The precious metals and precious stones still indeed retain a good deal of their former importance. But very few vegetable or animal products can be put in the same category. Rubber, indeed, may be reckoned as one, and very handsome profits are reaped from some rubber estates. But everyone knows that such exceptional profits can be reaped only for a short time. Of animal products ornamental feathers are the most valuable in proportion to their bulk. Egrets' feathers, I believe, are seldom worth less and often worth a good deal more than twice their weight in gold, but ornamental feathers altogether make up less than a third of 1 per cent. of the total value of British imports.

Perhaps the greatest feature of modern commerce is the unparalleled manner in which it has promoted the increase of population nearly all the world over. Rendering it possible for manufacturing and commercial peoples to depend in a very large measure for their very means of subsistence on supplies brought from the ends of the earth, it is rapidly pushing the settlement of vacant land to the base of the mountains and the edge of the desert. Fifteen years ago Prof. Bryce said, "We may conjecture that within the lifetime of persons now living the outflow from Europe to North America will have practically stopped."<sup>2</sup> We are at least nearing the time when the "new lands" of this earth in the temperate zone will all have been allotted. The results of such a check to expansion after a long period of stimulation to expansion must be momentous, but what the nature of these results will be I for one confess that I am unable to foresee. I am, however, convinced that, if we are to be enabled to make any probable forecast as to the course of future development, one of the most important aids to that result must consist in the study of the relations of geography and history from the

point of view which I have endeavoured to indicate. To study these relations merely with reference to the immediate causes and effects of wars and treaties gives little real insight into the working of geographical influences in history. As in the study of the human body medical men have recognised the necessity of ascertaining with the aid of the microscope the normal functions of the cells of which the body is composed, the pathological states that interfere with their normal working, and the effects on one part of the body of minute disturbances of function in another part, so in tracing the course of history it is becoming more and more recognised that the minute gradual silent changes must be inquired into and taken into account, not merely in relation to the regions in which they take place, but in relation, it may be, to regions far distant. Such studies, it is true, are not confined to the geographer. In them, indeed, the geographer must seek the aid of workers in other fields: but there can hardly be a doubt that it must help greatly towards arriving at a sound solution of the problems presented to keep steadily before one the geographical point of view. The field for such studies is of course immense, the material perhaps not all that could be wished; but I can imagine no task more delightful for those who have the opportunity to engage in it than that of seeking out and examining from that point of view such material as actually exists.

#### NOTES.

THE death is announced, at the age of fifty-one years, of Prof. Emil Petersen, professor of chemistry at the University of Copenhagen. Prof. Petersen was a pupil of and collaborator with Prof. Jørgensen and was well known for his researches in physical and analytical chemistry.

WE regret to see by the *Scientific American* that Prof. Angelo Heilprin died on July 17 at the age of fifty-four years.

THE sum of \$5000. has been given by Mr. W. H. Crocker, of San Francisco, to the University of California for the purpose of defraying the expenses of an expedition to observe the total solar eclipse of January 3 next, which will be visible on the Pacific coast.

THE Board of Trade is about to constitute a special temporary branch (under the direction of Colonel Sir Herbert Jekyll, K.C.M.G.) for the purpose of dealing with matters relating to London traffic so far as they come within the scope of the Board.

MR. H. C. PLUMMER, assistant in the Oxford University Observatory, has been appointed to a fellowship at the University of California in connection with the Lick Observatory on Mount Hamilton.

IN reply to a question put to him in the House of Commons on Thursday last by Mr. McCrae, the member for Edinburgh, East, as to whether he was in a position to say if he was able to accede to the request of the Scottish members of Parliament for a grant to the Scottish Meteorological Society for the purpose of reopening and maintaining the Ben Nevis observatories, the Chancellor of the Exchequer said the only scheme which had up to the present been placed before him was one under which the whole cost of the re-equipment and maintenance of the observatories would be thrown upon public funds, and to this he did not feel justified in assenting. He was, however, quite prepared to consider the question of renewing the Government grant, which was for many years given to these institutions through the Meteorological Council, provided that an adequate contribution towards their re-establishment and maintenance were forthcoming from other sources.

<sup>1</sup> "Imperial Gazetteer of India," 2nd ed., vol. vi., p. 362.

<sup>2</sup> "The Migrations of the Races of Men considered Historically," in the *Scottish Geographical Magazine*, 1892, p. 419.

A PARTY of observers, consisting of Dr. T. A. Jaggar, jun., head of the department of geology, Massachusetts Institute of Technology; Dr. H. S. Eakle, University of California; Prof. H. V. Gummery, professor of mathematics, Drexel Institute, Philadelphia, who will have charge of the magnetic observations; Dr. Van Dyke, who will study the botany and entomology of the islands; and Prof. F. T. Colby, who will investigate the natural history of the region, recently sailed from Seattle, Washington, to study the geological formation of the Aleutian group of islands and other scientific features of the archipelago. The investigators will, according to the *Scientific American*, pay particular attention to Perry Island, which suddenly rose from the sea more than a year ago. The party will begin working westward from Attu Island, and will devote several months to their researches.

DR. CHARCOT has furnished the *Geographical Journal* with further particulars of the plans for his new Antarctic expedition. The choice of the same field of exploration as on the former expedition was made, after due consideration of the plans of other expeditions now being organised or projected, for the following reasons:—(1) the importance of gaining further knowledge of the almost unknown Alexander I. Land; (2) the possibility of the existence in that region of an ice-barrier similar to that of Ross, over the surface of which an advance could be made; (3) the advantages of continuing the scientific work begun by the former expedition, and utilising the experience gained by it; (4) the support to be expected from the Argentine Republic in view of the excellent relations entered upon on the former occasion. The building of a special ship will, it is hoped, soon be begun. While large enough to permit the carrying out of scientific work under suitable conditions, the vessel will be small enough to enable it to navigate in safety along the coasts and to seek shelter in small coves. In addition to ordinary sledges, it is proposed to take motor-sledges for possible use on the surface of an ice barrier. Wandel Island is to be the final base of operations, and from this the coast of Alexander I. Land will be explored as far as possible, also the unknown area, scientific work being at the same time carried on at the base. During the second summer an attempt will be made to navigate westward as far as possible in the direction of King Edward VII. Land.

INFORMATION is given in the August number of the *Geographical Journal* respecting a new scientific expedition to the extreme south of South America which is being organised by Mr. Carl Skottsberg, one of the members of the recent Swedish Antarctic Expedition. The expedition, which will leave Gottenberg next month, will consist of Messrs. Skottsberg, P. Quesnel, and T. Halle. It will not sail in a ship of its own, but will make use of the ordinary mail steamers and coasting vessels for transport to the scene of operations, and will be equipped for botanical, geological, zoological, and meteorological work. Proceeding via Buenos Aires and Montevideo to the Falklands, the leader and Mr. Halle will there spend the summer of 1907-8 for the purpose of continuing the researches begun by the Swedish Antarctic Expedition, Quesnel meanwhile going to Punta Arenas, where he hopes to make an excursion to the Cerro Payne region. On re-uniting at Punta Arenas, the party will, if time permits, make an expedition to the northwards along the Cordillera and round Otway and Skyring waters, before winter sets in. This will be spent in the rainy region of the western channels, and in the spring an attempt will be made to reach Lago Fagnano, the party then moving its headquarters to the region of

Beagle channel. It is proposed to conclude the summer's work with a trip to Tekeenika Bay, returning to Sweden in April or May, 1909.

MR. CHARLES HAWKSLEY has commemorated the centenary of the birth of his late father by offering the sum of 1000*l.* to the council of the Institution of Mechanical Engineers for the foundation of a scholarship or premium. The offer has been accepted by the institution, and the terms on which the gift is to be held are under consideration.

Two sums, each of 250*l.*, have been received by the Institution of Mechanical Engineers from the Metropolitan Water Board and the chairman of the Court of Arbitration (under the Metropolitan Water Act, 1902), which the donors desire to be used for some engineering purpose connected with the institution. The council have invested the amount—500*l.*—in a trustee security, the income from which they have decided, after consultation with Sir Edward Fry, shall be offered biennially for a paper submitted in accordance with prescribed conditions. It has been further decided that the prize shall be known as the "Water Arbitration Prize," and shall be offered for a paper on an engineering subject to be announced by the council one year before the time for sending in the papers. The prize, which will have a value of approximately 30*l.*, will take any form which the council may from time to time decide upon, and will be accompanied by a certificate bearing the seal of the institution. If, in the opinion of the council, no paper of sufficient merit be received in reply to any particular offer of the prize, the amount available for that award will be added to the capital of the fund. The conditions for the first award, to be made in 1908, are that:—(1) The award will be made to the author of the selected paper dealing with the filtration and purification of water for public supply. (2) Members, associate members, associates, and graduates of the institution may compete. (3) Papers must be sent in to the secretary of the Institution of Mechanical Engineers, and must reach him not later than January 3, 1908. (4) Each paper must be clearly written, or typewritten, on one side only of foolscap paper, with a margin, and must be accompanied by an outline or synopsis of its contents of not more than six hundred words; any illustrations submitted with the paper must be properly drawn to scale. (5) Papers submitted for competition will become the property of the institution, and, at the discretion of the council, may be either read and discussed at a general meeting or printed in the Proceedings without having been so read and discussed. Each paper must consist of original matter written by the competitor himself, and the council will require a written statement to that effect. Any paper not accepted for printing in the Proceedings will be returned to the author. No paper which has been previously published will be accepted for competition.

A SPECIAL committee, with M. V. V. Podvysotski, director of the Institute of Experimental Medicine, as president, has been appointed by the Medical Council of the Russian Ministry of the Interior to study the question of establishing a committee for the investigation of cancer.

ACCORDING to the *Lancet*, the late Prof. Grancher, of Paris, has left to the society founded by himself, the object of which is the protection of children from tuberculosis, a sum sufficient to provide an annual income of 20,000 francs. Dr. Roux, director of the Pasteur Institute, has accepted the position of president of the society.

At the first meeting of the medical section of the Royal Society of Medicine, which is to take place on October 22, Dr. Hector Mackenzie will open a discussion on the complications and sequelæ of pneumonia and the treatment of pneumococcal infections by serum or vaccine. The section is now fully constituted, and is open to receive papers for reading and discussion during the winter session.

THE fourteenth International Congress of Hygiene and Demography will meet in Berlin from September 23 to September 29. A strong international committee has been constituted for the organisation of the meeting, which promises to be a very successful and interesting one. Of the British section, Sir Shirley Murphy is the chairman, Prof. Nuttall, F.R.S., and Mr. Paul Moline are the secretaries, and Mr. Cutler is the treasurer. The congress is divided into eight sections, and a number of interesting subjects have been selected for discussion. Anyone engaged scientifically or practically in hygiene or demography is eligible as a member, the subscription being 11., which entitles him to a copy of the transactions. Those not eligible for membership (e.g. the relatives of members) will be admitted to the sectional meetings, &c., on payment of a subscription of 10s. Some of the subjects selected for discussion are the ætiology of tuberculosis, pathogenic protozoa, alcoholism, care of infants, overwork in schools, caisson disease, uniform methods of testing disinfectants, preventive inoculation, housing of the working classes, artificial ventilation, sleeping sickness, and control of milk.

THE eighth session of the Australasian Medical Congress is to take place in Melbourne in October of next year. The president will be Prof. H. B. Allen, of the University of Melbourne. The eleven sections into which the congress is to be divided will be presided over respectively by Dr. G. E. Kennie, medicine; Dr. B. Poulton, surgery; Mr. E. T. Thring, obstetrics and gynaecology; Dr. J. T. Wilson, anatomy and physiology; Dr. F. Tidswell, pathology; Dr. J. M. Mason, public health and State medicine; Dr. J. Lockhart Gibson, diseases of the eye, ear, and throat; Dr. F. Truby King, neurology and psychiatry; Dr. A. Jefferis Turner, diseases of children; Surgeon-General W. D. C. Williams, naval and military surgery and medicine; Dr. W. McMurray, skin diseases, &c.

AN electrical exhibition lasting a fortnight is to be held in Montreal, commencing on September 2, and from September 11 to 13 the Canadian Electrical Association is also to meet in the same city, when the following papers, among others, will be read:—How to increase the load factor; some of the difficulties encountered in operating alternating current systems; new and old type incandescent lamps; the Nernst lamp; and electric heating and cooking appliances.

IN the Scottish National Exhibition to be held in Edinburgh in 1908 there will be sections devoted to fine arts, education and history, arts and crafts, mining, engineering and metallurgy, transportation and motive power, ship-building and waterways construction, chemistry and scientific appliances, lighting, heating and ventilation, agriculture, horticulture and sylviculture, domestic economy, sports and pastimes, botany and zoology, artisans' work, women's section, urban and rural improvements.

A RECENTLY issued report from the British Consul at Copenhagen states that the Danish Government has allocated the sum of 42761., to be used during the next

three years, for the purpose of the extermination of rats, on the understanding, however, that the sum of 16661. be expended over a like period by an organisation which is in existence for the destruction of rats. It is stated that a Danish patent rat destroyer has been invented, which, when eaten by rats, causes disease of the bladder, which kills them; whereas it may be swallowed by human beings, dogs, and poultry without danger.

IN connection with the international investigations of the upper air, conducted from July 22 to 27, several kite ascents have been made under the auspices of the Meteorological Office. A number of registering balloons (*ballons sondes*) have also been sent up, six at Manchester and three at Ross (Herefordshire), for the joint committee of the Royal Meteorological Society and the British Association; six at Petersfield by Mr. C. J. P. Cave; five at Crinan and four at Pyrton Hill, Oxon, for the Meteorological Office. The recording instruments for nearly all the ascents have been supplied by the Meteorological Office. Up to Monday, July 29, nine had been recovered, and one has been reported since. One balloon sent up at Ross, Herefordshire, on July 23, is reported to have reached the height of probably 60,000 feet, or about eleven miles. It is too early yet for any detailed results to be given.

As the annual presidential address to the Philosophical Society of Washington on December 1, 1906, Prof. C. Abbe read a most interesting and instructive paper on the progress of science as illustrated by the development of meteorology. The author pointed out that while some portions of this subject are as ready as exact as our knowledge of other sciences can make them, the path of progress is strewn with the wrecks of popular errors. Since the establishment of the Meteorological Society of the Palatinate at Mannheim in 1780, the advance made has been entirely in the direction of the line of work that it laid out, viz. to collect data from all parts of the globe for the purpose of compiling synoptic daily weather maps for the study of the atmosphere as a whole. At the present time the investigation of the upper air is being made throughout the world, and each national weather bureau is extending its field of observation horizontally, while each is now alive to the fact that satisfactory advance in practical meteorology requires corresponding progress in our knowledge of the sciences involved in the motions of the atmosphere. Another step in advance is due to the investigation of the interaction of the continental and oceanic hemispheres, to our knowledge of which subject the researches of Sir Norman and Dr. Lockyer, among others, have greatly contributed. This principle is already recognised by the directors of the Indian Meteorological Service in their forecasts of the approaching monsoons.

At the annual meeting of the National Association of Colliery Managers at Chesterfield on July 25, Mr. J. P. Houfton delivered the presidential address. He dwelt upon the increasing difficulty and complexity of the problems connected with mining as the shallower seams were exhausted, and urged the necessity for the colliery manager to be a man of scientific training and education. He considered that it was of national importance that a university of mining should be established in order to furnish the colliery managers of the future with the technical knowledge and scientific training required to enable them to work the deeper coal seams.

FOR the summer meeting of the Institution of Mechanical Engineers, which opened on July 30 at Aberdeen under the presidency of Mr. T. Hurry Rhodes, an interesting



programme of papers was arranged. Mr. William Simpson's paper on granite quarrying in Aberdeenshire was specially noteworthy in that it furnished information on a subject regarding which the technical literature is remarkably sparse. Nowhere in the whole of Great Britain is there such a large exposure of granite as in north-east Scotland, and the supply of granite of the highest durability and beauty is practically inexhaustible. The quarrying presents many features of difficulty. The overburden is costly to remove, and the top rock unremunerative. As a rule the quality of the rock improves with the depth, and there is a temptation to deepen without a proportionate surface area. Where this has been done the quarry has assumed the form of a conical pit with a small floor, difficult and costly to work. Mr. Herbert Bing submitted a paper on portable pneumatic tools. Of recent years there has been great progress made in these tools, and in the range of work to which they are applicable. At the present time they will be found in use in practically all engineering works, shipyards, and mines. Mr. C. E. Larard described an electrically controlled single-lever testing machine at the Northampton Polytechnic Institute, London. The machine constitutes quite a new departure in many of its arrangements, and has given very satisfactory results in testing, due primarily to the good control over the rates of loading and straining. Papers were also contributed by Mr. J. M. Henderson, on cableways used on shipbuilding berths, and by Mr. D. J. Macdonald, on jute preparing and spinning.

IN October, 1905, a committee was appointed by the council of the Royal Institute of British Architects to draw up rules for guidance in the use of reinforced concrete. The report of this committee has recently been published, and in the *Engineer* of July 26 the rules drawn up are compared with the French Government instructions. In the more important matters there is uniformity in treatment, and the rules proposed by the committee are by no means revolutionary.

THE fuels committee of the Motor Union of Great Britain and Ireland has issued a valuable report on motor-car fuels, of which a summary is published in the *Engineer* of July 26. Readers of the report will find cause for a despondent view of the petrol supply, and will probably agree that a famine in petrol appears to be inevitable in the near future, owing to the fact that the demand is increasing at a rate much greater than the rate of increase of the supply. In 1904 the consumption of petrol in the United Kingdom was 12,000,000 gallons; in 1907 it had risen to 27,000,000 gallons. In November, 1904, the trade price was 7d. per gallon; in December, 1906, it was 13d. Having recognised that the time is not far distant when a substitute for petrol must be sought, the committee discusses in the report other possible fuels. The supply is divided into two parts. The first includes all fuels limited in quantity; they are the spirits of a specific gravity between petrol and paraffin, paraffin itself, coal dust, gas, and benzol. The second group contains one item only—alcohol—and it is evident from the whole tone of the report that the committee expects to find in denatured vegetable spirits the fuel of the future.

AN article on the natural regeneration of the "dhowra" tree, *Anogeissus latifolia*, in the Panch Mahal division of Bombay, is communicated by Mr. R. F. Pearson to the May number of the *Indian Forester*. Owing to the occurrence of a large number of trees of an even age, the author was led to examine the conditions under which such

extensive seedling growth was developed. Whilst the rainfall in the year of germination was distinctly favourable, the opinion is expressed that, in addition, the seed must have been unusually fertile. The fertility of seeds from trees is a question deserving the attention of foresters. Mr. Pearson attributes the fertility of the seed in this instance to the stimulus or shock caused by the drought of the previous year. A note on the Kashmir trout fisheries refers to the attempts, finally successful, made by Mr. F. Mitchell whereby the Harwan stream and the Dhal Lake have been stocked with brown trout.

WITH reference to afforestation, in a paper printed in the Transactions of the Royal Scottish Arboricultural Society, vol. xx., part ii., Mr. A. C. Forbes discusses the problem of planting up waste land, and gives on record certain data, obtained by the measurement of sample plots of Scots pine, larch, and spruce, on plantations in Northumberland and Cumberland, showing an annual increment varying from 50 cubic feet to 80 cubic feet per acre. Figures are also presented, on the authority of Lieut.-Colonel F. N. Innes, for plantations in Aberdeenshire. Other papers in the volume include a summary of a paper by Mr. M. Henry on the interrelation between forests and rainfall, arboricultural notes from Portuguese East Africa contributed by Mr. J. A. Alexander, and an account of the work at Eberswalde Forest Academy by Mr. A. F. Wilson.

A DISSERTATION on the physiological significance of caffeine and theobromin, by Dr. Th. Weevers, is published in *Annales du Jardin botanique de Buitenzorg*, ser. ii., vol. vi. These xanthin derivatives were found in all parts except the roots of *Thea assamica* and *Coffea arabica*, but only in the early vegetative stages of *Coffea stenophylla* and *Cola acuminata*. From a comparison of the quantities obtained in young and maturing leaves, also in leaves placed in air devoid of carbon dioxide, the author concludes that these substances are formed as secondary products in the breaking down of proteins, and are subsequently absorbed in protein synthesis; in the seeds they are plentiful, forming a nitrogenous reserve.

A BULLETIN, No. 187, issued by the United States Department of Agriculture, deals with the digestibility and nutritive value of legumes, recording the results of experiments conducted by Dr. C. E. Wait at the University of Tennessee. Although these tend to prove that legumes are not so thoroughly digested as many other foods, the author recommends their inclusion as a source of protein in the diet, and directs attention to the value of cow-peas, the product of *Vigna Catjang*.

WE have received copies of two issues, No. 68, part i., and No. 69, of the Bulletin of the U.S. Bureau of Entomology, the former, by Mr. Dudley Moulton, dealing with the pear-thrips (*Euthrips pyri*), which in the latter Mr. F. M. Webster discusses the ravages of the chinch-bug (*Blissus leucopterus*). The pear-thrips flourishes in the districts around San Francisco Bay and the Sierra Nevada foot-hills, but whether it is an indigenous species which has become unusually numerous owing to the development of orchards, or whether it is introduced, has not yet been ascertained. In 1905, when this insect was exceedingly numerous, the pear-crops were hopelessly blighted, but how much of the injury was due to the thrips and how much to wet weather is uncertain. Owing to the long period spent by the thrips underground, remedial measures are difficult to apply. Practically the whole of the eastern half of the United States is infested by the chinch-bug,

which is represented by a short-winged maritime phase and a long-winged inland form. It is a migratory, two-brooded species, which originally fed upon the native grasses, but has now turned its attention to wheat and other cereals. On reaching a suitable food-supply, the insects congregate on the plants until these are literally covered with individuals of various ages, ranging in colour from the vermilion of the older larvæ to the black and white of the adults. When the plant is drained of its juices, the larvæ move on to the next one, the adults alone making long migrations.

THE African honey-guides (Indicatoridæ), which have acquired parasitic habits parallel to those of cuckoos, are wiser in their generation than the latter, for (as we are told by Mr. A. Haagner in the *Journal of the South African Ornithologists' Union* for June) they are in the habit of breaking the eggs of the birds they select as foster-parents for their offspring. This is illustrated by a plate in the same issue, where two of the fractured eggs are shown. In some cases, however—probably when they are attacked by the future foster-parents—they do not succeed in breaking the rival eggs, in which event it is probable that the strong hooks on the tip of the beak of the young honey-guides come into play for the purpose of aiding in the ejection of the other occupants of the nest. A nestling of one species of honey-guide is represented in a second plate. It may be added that most of the plates in this issue are lettered vol. iii., whereas the cover is lettered second series, vol. i., No. 1. The idea of commencing a second series with the third volume of this serial thus seems to have been an afterthought—and a by no means happy one.

SLUGS, according to Mr. B. B. Woodward's presidential address to the Malacological Society for 1907, are more specialised creatures than snails, for among molluscs of all classes there appears to be a general tendency, more especially in the carnivorous types, to discard the shell as the result of the assumption of more active habits than ordinary. Other instances of adaptive modifications in the group are mentioned in the same address.

IN *Science Progress* for July (ii., No. 5), Dr. Bashford discusses the application of experiment to the study of cancer, and summarises the results obtained by a study of the development of transplanted cancer in mice.

We are asked by the author, Mr. Arthur Trewby, to state that the little volume entitled "Healthy Boyhood," which was reviewed in our issue of July 25, may be obtained post free for 1s. 6d. from the author, Fenton House, The Grove, Hampstead Heath, N.W.

### OUR ASTRONOMICAL COLUMN.

ASTROGRAPHIC CATALOGUE WORK AT THE PERTH OBSERVATORY (W.A.).—Mr. W. Ernest Cooke, Government astronomer of Western Australia, informs us that the prospect for the astrographic catalogue work are not now so hopeless as they appeared from the report referred to in *NATURE* of May 23 (p. 89). He says that the present Government recognises the importance of the work, and a start has been lately made to measure the plates. It is feared, however, that the images will deteriorate before the completion of the work. Upon comparing a plate taken a few years ago with a recent one of the same region, the image of a ninth-magnitude star on the former was found to be about equal to that of a 9.5 magnitude on the latter. With reference to the 10,000 standard stars which have to be observed by means of the transit circle, Mr. Cooke hopes to obtain good positions of all these stars (three observations of each) in ten or twelve years, and certain zones have been completed already.

NO. 1971, VOL. 76]

It is proposed to make this list of stars the standard work at the Perth Observatory, observing and re-observing exactly the same list, in order to obtain good determinations of the position of each star every ten years or so.

DANIEL'S COMET (1907d).—This comet is now approaching the naked-eye stage, and may be found quite readily with small opera glasses. On August 9 it will rise at about 12h. 45m., some 3½ hours before the sun. On August 14 the comet will be about 46' north of γ Geminorum. An observation made on August 1 showed no indication of a tail, but the comet has a well-defined nucleus.

MARS.—Telegrams received from the Lowell expedition to the Andes announce that on July 2 Mr. Slipher photographed several of the canals, and that on July 6 canals were seen double and oases were photographed (*Astronomische Nachrichten*, No. 4193, p. 291, July 26).

In vol. xxvi., No. 1 (p. 1, July), of the *Astrophysical Journal*, Prof. Newcomb discusses the optical and psychological principles involved in the interpretation of the so-called canals of Mars. From the optical point of view he shows that in the best refracting telescopes the effects of aberration, diffraction, and atmospheric softening will materially increase the breadth of any linear marking. As a rough estimate he submits that a perfectly black line on Mars three miles in breadth might be visible if the surface of the planet were perfectly uniform, but, as it is not, the actual breadth would have to be increased to eight or ten miles in order that the feature might be differentiated from those surrounding it. Aberration, &c., would spread a marking of this width for some twenty miles on each side, so that the apparent breadth in the telescope would be fifty miles or upward. Allowing this width to each of the 400 canals mapped by Lowell, the total area covered would be 33,000,000 square miles, the actual surface of Mars extending over some 55,000,000 square miles. Although this large relative area does not disprove the objective reality of the canal system, it shows how wide the interpretation of the results must of necessity be, when the whole network is crowded on to a disc only 20" in diameter. Concerning the interpretation of such features by different observers, Prof. Newcomb gives some illustrated results of a number of interesting experiments he has carried out in this direction.

SOME NEW APPLICATIONS OF THE SPECTROHELIOGRAPH.—Using a temporary spectroheliograph of 30 feet focal length, Prof. Hale has obtained spectroheliograms with the primary slit set on some of the dark lines which are found strengthened in the sun-spot spectrum. The lines employed in this preliminary work were those which appear to be strengthened in the umbra and penumbra and on the photosphere for some distance from the spots, and the resulting photographs show the umbra and penumbra much darker than they appear on plates taken with the light of the continuous spectrum; the diameter of the spot also appears to be considerably increased. Lines weakened in sun-spots were also tried and gave definite results, which are, however, less marked than in the case of the strengthened lines. For work with the numerous faint lines of the spot spectrum a large dispersion is absolutely essential, and a suitable instrument is being constructed for use with the new vertical telescope.

Prof. Hale has also obtained some spectroheliograms for stereoscopic examination, which, when viewed with a stereoscope, show the masses of flocculi standing boldly above the general level of the hemisphere. A pair of these, taken at an interval of 2h. 5m., are reproduced in the *Astrophysical Journal* (vol. xxv., p. 314, June). It is hoped that by examining such pairs of spectroheliograms in the stereocomparator changes may be detected in the appearance of the flocculi, &c., which might otherwise escape detection.

THE "ANNUARIO" OF THE RIO DE JANEIRO OBSERVATORY.—The twenty-third annual publication of the Rio de Janeiro Observatory, for 1907, which we have just received, is very much like its predecessors, and contains an exposition of various calendars, numerous tables and data useful to astronomers, and a compilation of various physical data which will be found of general use.